

What is claimed is:

1. A digital signal transceiver comprising:

a frequency modulator for outputting a first high-frequency signal frequency-modulated with a digital signal input thereto in a transmitting mode, and for outputting a second high-frequency signal in a receiving mode, the second high-frequency signal being not modulated and containing a phase noise different in level from a phase noise in the first high-frequency signal;

a power amplifier for receiving a signal output from the frequency

10 modulator;

an antenna terminal arranged to be connected to an antenna;

an antenna switch comprising

a first branch port for receiving a signal output from the power amplifier,

15 a common port connected to the antenna terminal, said common port being connected to the first branch port in the transmitting mode, and

a second branch port connected to the common port in the receiving mode;

20 a filter having an input port thereof connected to the second branch port of the antenna switch;

a high-frequency amplifier having an input port thereof connected to an output port of the filter; and

25 a mixer for mixing a signal output from the high-frequency amplifier with the signal output from the frequency modulator to output a signal including the signal from the high-frequency amplifier and the signal from the frequency modulator.

2. The digital signal transceiver according to claim 1, wherein the phase noise in the second high-frequency signal has a level larger than a level of the phase noise in the first high-frequency signal.

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3. The digital signal transceiver according to claim 1, wherein the frequency modulator comprises

a reference signal generating unit for generating a first reference signal,

10 a variable-frequency oscillator for outputting a signal having a frequency varying according to a signal input thereto,

a first frequency divider for frequency-dividing the signal output from the variable frequency oscillator,

15 a phase comparator for comparing a signal output from the first frequency divider with the first reference signal in phase, and

a low-pass filter having an input port thereof connected to an output port of the phase comparator, said low-pass filter outputting the signal input to the variable-frequency oscillator.

20 4. The digital signal transceiver according to claim 3, wherein the first reference signal has a frequency in the transmitting mode higher than a frequency in the receiving mode.

25 5. The digital signal transceiver according to claim 3, wherein the reference-signal generating unit comprises

a reference signal generator for generating a second reference signal, and

5 a second frequency divider for outputting the first reference signal by frequency-dividing the second signal by a first dividing rate in the receiving mode, and by frequency-dividing the high-frequency signal by a second dividing rate larger than the first dividing rate in the transmitting mode.

6. The digital signal transceiver according to claim 3,

10 wherein the variable frequency oscillator comprises a voltage-controlled oscillator for outputting a signal having a frequency varying according to a voltage input thereto, and

15 wherein the frequency modulator further comprises a charge pump for receiving the signal output from the phase comparator and for supplying a first current to the low-pass filter in the transmitting mode and a second current larger than the first current in the receiving mode to the low-pass filter according to the signal output from the phase comparator.

7. The digital signal transceiver according to claim 3, wherein the low-pass filter has a cut off frequency in the transmitting mode higher than a cut-off frequency in the receiving mode.

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8. A digital signal transceiver comprising:

25 a frequency modulator for outputting a first high-frequency signal frequency-modulated with a digital signal input thereto in a transmitting mode, and for outputting a second high-frequency signal in a receiving mode, the second high-frequency signal being not modulated, said frequency modulator comprising

a reference signal generating unit for generating a first

reference signal having a frequency in the transmitting mode lower than a frequency in the receiving mode,

a variable-frequency oscillator for outputting a signal having a frequency varying according to a signal input thereto,

5 a first frequency divider for frequency-dividing the signal output from the variable frequency oscillator,

a phase comparator for comparing a signal output from the first frequency divider with the first reference signal in phase, and

10 a low-pass filter having an input port thereof connected to an output port of the phase comparator, said low-pass filter outputting the signal input to the variable-frequency oscillator;

a power amplifier for receiving a signal output from the frequency modulator;

an antenna terminal arranged to be connected to an antenna;

15 an antenna switch including

a first branch port for receiving a signal output from the power amplifier,

20 a common port connected to the antenna terminal, the common port being connected to the first branch port in the transmitting mode, and

a second branch port connected to the common port in the receiving mode;

a filter having an input port thereof connected to the second branch port of the antenna switch;

25 a high-frequency amplifier having an input port thereof connected to an output port of the filter; and

a mixer for mixing a signal output from the high-frequency

amplifier with the signal output from the frequency modulator to output a signal including the signal from the high-frequency amplifier and the signal from the frequency modulator.

5        9. The digital signal transceiver according to claim 8, wherein the reference signal generating unit comprises

·            a reference signal generator for generating a second reference signal, and

10        a second frequency divider for outputting the first reference signal by frequency-dividing the second reference by a first dividing rate in the receiving mode, and by frequency-dividing the high-frequency signal by a second dividing rate larger than the first dividing rate in the transmitting mode.

15        10. The digital signal transceiver according to claim 8,

      wherein the variable frequency oscillator comprises a voltage-controlled oscillator for outputting a signal having a frequency varying according to a voltage input thereto, and

20        wherein the frequency modulator further comprises a charge pump for receiving the signal output from the phase comparator and for supplying a first current to the low-pass filter in the transmitting mode and a second current larger than the first current according to the signal output from the phase comparator.

25        11. The digital signal transceiver according to claim 8, wherein the low-pass filter has a cut off frequency in the transmitting mode higher than a cut-off frequency in the receiving mode.

12. A digital signal transmitting and receiving apparatus comprising:

a frequency modulator for outputting a first high-frequency signal frequency-modulated with a digital signal input thereto in a transmitting mode, and for outputting a second high-frequency signal in a receiving mode, the second high-frequency signal being not modulated, the frequency modulator comprising

a reference signal generating unit for generating a reference signal,

10 a voltage-controlled oscillator for outputting a signal having a frequency varying according to a voltage input thereto,

a frequency divider for frequency-dividing the signal output from the variable frequency oscillator,

15 a phase comparator for comparing a signal output from the frequency divider with the reference signal in phase,

a charge pump for receiving the signal output from the phase comparator and for outputting a first current in the transmitting mode and a second current in the receiving mode according to the signal output from the phase comparator,

20 a low-pass filter receiving the first and second currents and outputting the signal input to the voltage-controlled oscillator.

a power amplifier for receiving an output signal from the frequency modulator;

an antenna terminal arranged to be connected to an antenna;

25 an antenna switch comprising

a first branch port for receiving a signal output from the power amplifier,

a common port connected to the antenna terminal, the common port being connected to the first branch port in the transmitting mode, and

5 a second branch port connected to the common port in the receiving mode;

a filter having an input port thereof to the second branch port of the antenna switch;

a high-frequency amplifier having an input port thereof to an output port of the filter; and

10 a mixer for mixing a signal output from the high-frequency amplifier with the signal output from the frequency modulator to output a signal including the signal from the high-frequency amplifier and the signal from the frequency modulator.

15 13. The digital signal transceiver according to claim 12, wherein the low-pass filter has a cut off frequency in the transmitting mode higher than a cut-off frequency in the receiving mode.

14. A digital signal transmitting and receiving apparatus comprising:

20 a frequency modulator for outputting a first high-frequency signal frequency-modulated with a digital signal input thereto in a transmitting mode, and for outputting a second high-frequency signal in a receiving mode, the second high-frequency signal being not modulated, the frequency modulator comprising

25 a reference signal generating unit for generating a reference signal,

a variable-frequency oscillator for outputting a signal

having a frequency varying according to a signal input thereto,

      a frequency divider for frequency-dividing the signal output from the variable frequency oscillator,

      a phase comparator for comparing a signal output from

5      the frequency divider with the reference signal in phase, and

      a low-pass filter having an input port thereof connected to an output port of the phase comparator, said low-pass filter outputting the signal input to the variable-frequency oscillator, the low-pass filter having a cut off frequency in the transmitting mode higher than a cut-off frequency in

10     the receiving mode;

      a power amplifier for receiving a signal output from the frequency modulator;

      an antenna terminal arranged to be connected to an antenna;

      an antenna switch comprising

15      a first branch port for receiving a signal output from the power amplifier,

      a common port connected to the antenna terminal, the common port being connected to the first branch port in the transmitting mode, and

20      a second branch port connected to the common port in the receiving mode;

      a filter having an input port thereof connected to the second branch port of the antenna switch;

      a high-frequency amplifier having an input port thereof connected to an output port of the filter; and

      a mixer for mixing a signal output from the high-frequency amplifier with the signal output from the frequency modulator to output a

signal including the signal from the high-frequency amplifier and the signal from the frequency modulator.